of the genus Echinopepon and its allies, a number of new species being described and figured; A synopsis of the species of Heliocarpus, containing fifteen species; A synopsis of the American species of Hermannia; A synopsis of *Drymaria nodosa* and its allies; and Descriptions of miscellaneous new species, thirty-five in number, and with numerous illustrations.—J. M. C.

MR. CHAS. RICHARDS DODGE[4] has published the results of his long investigations among useful fibers. It is an enumeration of 1018 species of useful fiber plants, the more important of which are fully described and treated from the botanical, agricultural, and industrial standpoints. It is much more than a list of commercial species, for it is especially interesting in its presentation of the native fibers. The aboriginal American fibers have never before been brought together in such a complete way. The contribution is a great compendium of useful knowledge, to secure which Mr. Dodge has enjoyed special facilities. He is to be thanked for a very valuable contribution to the literature of economic botany.—J. M. C.

NOTES FOR STUDENTS.

A NEW AUXANOMETER is described by L. C. Corbett in the ninth annual report of the West Virginia Experiment Station for 1896. It is a lever instrument recording by pen upon a slowly revolving drum. The plant is attached to the short arm of the lever by platinum wire.

Other topics treated by the same writer are the greater vigor of northern grown seeds, bulbs, and cuttings, demonstrated by a large number of experiments; the behavior of cuttings, especially from tuber producing plants; and the injuries due to forest fires.

In the same report A. D. Hopkins discusses the life zones of West Virginia and the distribution of trees. The Canadian, transition, and upper austral zones can be traced, although the three marked areas of spruce, pine, and hard wood forests do not coincide with them. Three maps accompany the paper.—J. C. A.

RECENT BULLETINS from the experiment stations contain botanical matter of interest as follows: A. S. Hitchcock (Kas. no. 66, pp. 19–54) presents the fourth bulletin in a series on Kansas weeds, assisted by George L. Clothier. It is devoted to the fruits and seeds, including a description and illustration of each of the 209 species embraced in the list. The plates are

[4] DODGE, CHARLES RICHARDS.—A descriptive catalogue of useful fiber plants of the world, including the structural and economic classification of fibers. Report no. 9, U. S. Department of Agriculture. Fiber investigations. Pp. 361. *Pl. 1–12.* 1897.

admirably drawn, and bear the signature of Bertha S. Kimball. A key is arranged to aid in identification. J. W. Toumey (Ariz. no. 22, pp. 3–32) gives much general information about weeds of Arizona. In a list of 50 species nearly three-fourths are not known, or rarely seen, east of the Mississippi river. Sixteen species are singled out for more extended description, and twelve are illustrated. The only weed law of the state is directed against cockleburs and sunflowers along irrigating canals. A thick bulletin (Ore. no. 45) on prunes in Oregon, by four collaborators, contains a historical account of the varieties cultivated (pp. 21–33) and of the fungous diseases (pp. 63–75), written by U. P. Hedrick. An account of *Cicuta vagans* Greene is also given by U. P. Hedrick (Ore. no. 46, pp. 3–12, *pl. 4*). The underground parts are very poisonous while dormant, a piece the size of a walnut being sufficient to kill a cow. Two plates illustrate the plant, and two others show harmless species resembling it. F. H. Hillman (Nev. no. 33, pp. 3–13) gives notes upon a number of indigenous Nevada grasses, looking toward their utility as forage. In a bulletin by S. A. Beach (N. Y. no. 125) upon growing tomatoes under glass, two pages and one plate are given to a description of a peculiar black rot of the fruit written by F. C. Stewart. The cause was not ascertained. In the early stages no fungi or bacteria could be detected either by means of the microscope or agar cultures.—J. C. A.

DR. ROBERT BELL, of the Canadian Geological Survey, gave a very interesting address before the Royal Scottish Geographical Society at Edinburgh last March on the geographical distribution of forest trees in Canada. This address has recently been published with a map.[5] The author is exceptionally well fitted for this work by reason of forty years of observation throughout Canada. He states that there are 340 species of trees indigenous to the United States, 123 of which occur in Canada, 94 being found east of the Rocky mountains. *Pinus Banksiana* is mentioned as the only tree that may be considered as belonging to Canada, entering the United States only along the south shore of Lake Superior. It seems too bad to deprive the Canadians of the only tree to which they lay claim, but the species in question is very common about Lake Michigan, extending as far south as northern Indiana. The manuals also report *Pinus Banksiana* in Maine, Vermont, and New York. Some trees, especially the more hardy species, are said to taper off gradually in size as they approach their northern limits, while others, especially the more southern species, maintain their full size. The former habit would, of course, seem natural, owing to the gradually increasing rigor northward. Dr. Bell attributes the differences to the fact that the first type have better means of distribution (*e. g.*, seeds of conifers and poplars, fitted for wind dispersal), and have had time since the Pleistocene to occupy all territory congenial to their existence. The second type (including walnuts,

[5] Scot. Geog. Mag. **13**: 281–296.

basswood, etc.) migrate more slowly, and are yet far from their rightful limits. Some of the trees of the second class have been transplanted successfully far to the north of their natural habitat.

The conditions governing distribution are listed as follows: (1) Distance or proximity of the sea. Most tree lines are more or less parallel to the Atlantic ocean and Hudson bay, as a rule appearing to shun the salt water. *Pinus Banksiana*, for instance, never comes to the coast, but appears almost everywhere else, even having outliers in the center of Nova Scotia and New Brunswick. *Populus balsamifera*, however, seems to love the sea, and is absent from a vast area in the interior. (2) Geological changes in arrangement of land and water. Some erratic lines, seen especially in the balsam poplar, are probably due to peculiarities in the distribution of glacier ice. *Thuya occidentalis* has the most remarkable line of all, turning abruptly southward both in the east and west; the cause in the east is thought to be the recent insular condition of Nova Scotia. This species has a large outlier 300 miles north of its regular line. (3) General dryness or moisture. Dr. Bell makes a strong argument for drought as the cause of treeless prairies rather than forest fires; the tree lines are not sharp but concentric, and the more hardy trees have their lines farther out into the dry region. (4) Extremes of heat and cold. (5) Local heat and moisture from lakes and rivers. This usually results in a further extension northward along river courses than on the uplands. (6) General elevation above the sea. This may account for the absence of the elm and black ash in a large interior area, since they occur on all sides of this region. (7) Local elevations. (8) Local depressions. (9) Diseases and insect pests. (10) Rapid or slow means of dispersion. (11) Forest fires. These are said to be frequent as natural phenomena. After a fire there springs up a low shrub and herb vegetation, then poplars, birches, and willows in about 20 years. Conifers dominate again in 50 years and reach maturity in about 150 years.—H. C. C.

THE WEEDS of Canada are treated briefly in a bulletin (no. 28) of 39 pages from the Central Experimental farm, prepared by Dr. James Fletcher. General methods for the control and extermination of weeds are given, followed by descriptions and illustrations of the following fourteen species of weeds possessing special interest: *Sisymbrium altissimum* L., *Arabis hirsuta* Scop., *Conringia orientalis* Andrz., *Neslia paniculata* Desr., *Thlaspi arvense* L., *Lepidium apetalum* Willd., *Saponaria Vaccaria* L., *Silene Cucubalus* Wib., *Hieracium aurantiacum* L., *Cynoglossum officinale* L., *Echium vulgare* L., *Salsola Kali Tragus* Moq., *Rumex crispus* L., and *Hierochloa borealis* R. & S. The first six species belong to the Cruciferæ. Much information regarding the more prominent Canadian weeds, numbering over one hundred and sixty species, is thrown into tabular form and made easy of reference.—J. C. A.

DR. J. P. LOTSY has concluded an elaborate study on the localization of alkaloids in cinchonas, the results of which, illustrated by twenty colored plates, are to appear in Dutch. In order to render the larger work more intelligible to foreigners, he publishes in German[6] a concise account of the more important results. These are as follows:

The alkaloid is found in the contents of living parenchyma, even the nutritive parenchyma. It is not found, however, in cells containing calcium oxalate, nor in sieve tubes. In general (there are exceptions) the alkaloid in young members is dissolved in the cell sap. On the contrary, in older parts, *e. g.*, in the secondary bast of stems, it exists as a solid amorphous substance in the interior of the cells. Very active parts, such as the cambium or the apical meristem, as a rule contain no alkaloid, but at a short distance from the centers of activity it is found in large amounts.

Dr. Lotsy announces that these researches are preliminary to an inquiry into the physiological rôle of the alkaloid in the plant, investigations in this direction having already been begun.—C. R. B.

IN THE *Botanisches Centralblatt* (**70**: 184–189. 1897) Dr. R. Kolkwitz, has a useful summary of the literature on the movements of swarm spores, spermatozoids, and plasmodia, and their dependence upon external factors. He covers the period from 1885 to 1896, and gives a list of 75 papers.—C. R. B.

AMANN recommends[7] the following fluid, which he calls lactophenol, as a medium for restoring dried mosses, algæ, etc., to their natural size, and for mounting them: crystallized phenol, c. p., 20^{gm}; lactic acid (sp. gr. 1.21), 20^{gm}; glycerin (sp. gr. 1.25), 40^{gm}; distilled water, 20^{gm}. Herbarium material should first be warmed in dilute lactophenol and then treated with the pure. Five per cent. lactophenol in water, to which is added 0.2 per cent. each of copper chloride and copper acetate, is specially adapted to the preservation of algæ.—C. R. B.

CHODAT has exposed spores and developing mycelium of *Mucor Mucedo* to a temperature of $-70°$ to $-110°$ C. for several days without killing them. The low temperature did not better the capacity of the spores for germination, as Eriksson found a temperature of $-12°$ C. did for spores of Uredineæ.[8]—C. R. B.

DR. J. GRÜSS summarizes the results of a recent installment of his "Studien über Reservecellulose"[9] thus:

[6] Bot. Centralblatt **71**: 395. 1897.

[7] Zeitschr. f. wiss. Mikros. **13**: —. 1897.

[8] Bot. Centralblatt **70**: 242. 1897.

[9] Bull. de l'Herbier Boissier **4**: —. 1896. Cf. Bot. Cent. **70**: 267. 1897.

In germination the diastatic enzyme penetrates from the cell lumen into the thickened cell wall, the more copiously the nearer the scutellum. [The seed under investigation was *Phœnix dactylifera*.] Upon the penetration of the enzyme there follows a fractional hydrolytic solution by which galactan is removed from the cell wall. This produces the hyaline marginal zone. The mannin remain ingin this hyaline zone succumbs to alloolysis; that is, the mass penetrated by the enzyme passes into various stages of mannin and finally into mannose. According to the reactions one can distinguish a leucomannin and a cyanomannin.—C. R. B.

PHYSIOLOGISTS will find in the *Pharmaceutical Review* for September two valuable articles touching the chemistry of plants. One is a summary of recent literature on oak bark tannins *à propos* of some researches on the caffein compound of kola (**15**: 172) by Knox and Prescott. The other is a résumé of progress in the chemistry of the carbohydrates during 1896, by W. E. Stone (**15**: 178).—C. R. B.

MONTEMARTINI has prosecuted researches upon the physiology of the primary and secondary meristem of various plants.[10] He finds that the activity of the growing point shows a grand period dependent upon internal factors. There exists a connection between apical and secondary growth; the curve of the former is parallel with that of the latter; the maximum of apical activity corresponds to the greatest elongation of the growing zone; both are equally affected by external agents. The secondary meristem shows a like periodicity, independent, however, of that of the apical region.

The author also discusses the formation of annual rings. He concludes (with Jost and Mer) that their production is an immediate consequence of spontaneous and periodic variations in the activity of the cambium, and (with Unger) that the periodicity of the cambial activity, though independent of that of the primary meristem, is synchronous with it and influenced, like it, by external conditions.—C. R. B.

ANCIENT EGYPTIAN bread taken from the tomb of Mentuhotep and now in the Royal Museum at Berlin is found by L. Wittmack[11] to still give the iodine test for starch. Microscopical study shows it to be made from barley, and to contain the remains of yeast and bacteria. This indicates that barley is probably older as a cultivated grain than wheat, and that yeast, or dough of the previous baking, was doubtless used in those ancient times. The bread is estimated to be fully 4400 years old.—J. C. A.

[10] Atti dell Istit. Bot. della Univ. di Pavia II. **5**: —. 1896. Cf. Bot. Centralblatt **70**: 276. 1897.

[11] Bot. Centr. **71**: 328. 1897.

PROFESSOR BELAJEFF has recently published two preliminary papers announcing important discoveries in the spermatogenesis of Filicineæ[12] and Equisetineæ[13]. This author has previously given considerable attention to the process of spermatogenesis in various groups of plants, and his critical work on the spermatogenesis of the Characeæ led largely to the establishment of the view that the body of the spermatozoid is formed not only of the nucleus but also of the cytoplasm of the cell. His recent studies on the Filicineæ and Equisetineæ, he announces, have given him many opportunities to observe the correctness of this view. The main object of the present preliminary papers is to call attention to the office of an organ discovered in the spermatic cells, which ultimately forms a spiral band from which the cilia of the spermatozoid are developed.

In the spermatic cells of ferns, fixed with vapor of osmic acid and stained with a mixture of iodine green and fuchsin, small round bodies were found which stained very intensely. They are located in the cytoplasm near the nuclear wall, which is frequently somewhat indented at this point. These spheres reminded the author of centrosomes, and a careful examination was thus made of the dividing cells of the spermatic tissue. However, no indication of a centrosome could be detected. The first change which takes place in the spermatic cell is the gradual extension of this sphere, which becomes crescent shaped, and finally develops into a thread which encircles the nucleus. By a very careful examination the author was able to determine that this thread, which stains very intensely, runs along the edge of a lighter stained band which represents the first foundation of the body of the spermatozoid. It lies in the cytoplasm and stains bright red. In its further extension this band assumes the form of a spiral (apparently helicoid, judging from the author's description), of which the extended turns of the rear end encircle the nucleus, while the much smaller turns of the front end or apex of the spiral terminate free in the cytoplasm of the cell. The cilia, which are at first short but gradually increase in length, arise from the front end of this spiral and are directed backward. While the band is developing, the nucleus of the spermatic cell also undergoes considerable change. It begins to stretch out along the spiral band, becoming first reniform, then crescent shaped, and finally assumes a spiral form, the rear end of which is much the thickest. In the mature spermatozoid the hinder part consists of a spiral shaped, dense nucleus, which is surrounded by a layer of cytoplasm. On the rear end a continuation of the layer of cytoplasm forms an appendage. The front end of the spermatozoid has a band-like form, reacts the same as cytoplasm, and appears to be a continuation of the surrounding layer of cytoplasm. A thin

[12] Ueber den Nebenkern in spermatogenen Zellen und die Spermatogenese bei den Farnkräutern. Ber. d. deutsch. bot. Ges. **15**: 337–339. 1897.

[13] Ueber die Spermatogenese bei den Schachtelhalmen. Ber. d. deutsch. bot. Ges. **15**: 339–342. 1897.

thread, staining intensely with fuchsin, runs along the upper edge of this plasma band, which is the spiral thread or band formed by the extension of the sphere. The cilia, somewhat over forty in number, are attached to the two front turns of the spiral body of the spermatozoid, which in the mature condition does not have more than three turns.

In the spermatic cells of the Equisetineæ the bodies associated with the nucleus are not round as in the ferns, but crescent shaped, with the convex side turned toward the nucleus. Here, as in the ferns, the first change observed in the metamorphosis of the spermatic cell is in this body, which changes its form, turning its concave side toward the nucleus, around which it then begins to extend. It soon assumes a thread-like form and encircles the nucleus in the form of a spiral. Here also, as in the ferns, the writer was able to discover that an intensely colored thread runs along the edge of a less intensely stained band. The gradually elongating thread, which appears at first to be homogeneous, when it has completed its extension becomes granular. Small knobs then appear on the thread, which gradually become hook shaped, and finally extend into thread-like outgrowths, which form the cilia of the mature antherozoid. While the spiral thread and band are developing, the nucleus gradually elongates, as in the ferns, and finally assumes the form of a short spiral.

The mature spermatozoid has the form of a spiral with about two turns, and bears a large number of cilia on the front turn. The anterior portion of the spermatozoid appears as a comparatively small band, while the posterior portion forms a much thicker body and contains the nucleus which, as in the ferns, is surrounded by a sheath of cytoplasm. The thread which is formed from the crescent shaped body of the spermatic cell runs along the upper edge of the front end of the spiral.

In the Equisetineæ Belajeff was able to trace plainly the development of the cilia from the spiral thread formed by the extension of the crescent shaped body. In the ferns this connection was not traced, but from the analogy of the two cases, the author thinks there can be no doubt but that the spherical body (*Nebenkern*) in the ferns performs the same function.

By comparing these results with his previous studies of the spermatogenesis in Characeæ, the writer thinks that the tubercle (*Höcker*), which he found there in the spermatic cells, corresponds to the cilia forming body in the Equisetineæ. The tubercle, which has also been observed by Strasburger, lies near the nucleus, and becomes extended into a thread that ultimately bears the two cilia.

In a third preliminary paper Belajeff discusses the similarity of the phenomena of spermatogenesis in animals and plants.[14] The changes in the form

[14] Ueber die Aehnlichkeit einiger Erscheinungen in der Spermatogenese bei Thieren und Pflanzen. Ber. d. deutsch. bot Ges. **15** : 342–345. 1897.

and structure of the nucleus occurring in the metamorphosis of the spermatic cells of the salamander, as described by Flemming, the writer claims are similar to the changes which he has observed to occur in the spermatogenesis of the Filicineæ, Equisetineæ, and Characeæ. It is further pointed out that Hermann has described the occurrence of a small body (*Nebenkern*) near the nucleus in the spermatic cells of the salamander. Belajeff believes this *Nebenkern* to be homologous with the cilia forming body which he has discovered in the Equisetineæ and Filicineæ.—HERBERT J. WEBBER.